Space Weather Forecast

Issued on Wednesday, 21 December 2022 at 13:23 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Chance of Moderate-class X-ray flares and Minor Geomagnetic Storms.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been Moderate, with a Moderate-class flare peaking at 20/1408 UTC from a long region in the northeast, which has produced the majority of activity during the period. There are seven sunspots on the disc. The region mentioned above is an elongated group with a series of relatively small leader spots, but no penumbra now on the trailer spots. There is some magnetic complexity, especially due to its proximity to a smaller following region, which also has some magnetic complexity. The split between these two regions is difficult to determine. A further region in the southeast has also been active during the period, but is now starting to fade. The largest region in the southwest has a large leader spot with nearby reverse polarity spot emergence, but has seen fading of its trailing spots and it remains inactive so far. This region and another more active region to the northwest of it are now approaching the southwest limb. The other regions are generally smaller and stable.
A filament (arc of plasma) lifted off from the northwest around 20/2000 UTC and an eruption occurred near AR3169 associated with a large common-class flare at 21/0519 UTC. Both these events are considered not to be Earth directed and thus no Earth-directed Coronal Mass Ejections (CMEs) were observed in the period, but further analysis is ongoing.

Solar Wind / Geomagnetic Activity: Solar winds have been indicative of one or perhaps two weak transient features passing Earth, likely due to glances from a CME, potentially coupled with a weak enhancement from a coronal hole. Solar wind speeds remained at background levels, around 350-400 km/s. The total Interplanetary Magnetic Field was mostly Moderate, with oscillations in the north-south component. Geomagnetic activity was Quiet to Unsettled, Kp 1-3.

Energetic Particles / Solar Radiation: The count rate of observed energetic particles (high energy protons) remained at background levels with no solar radiation storms observed.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is expected to be Low to Moderate, with occasional Common-class flares and an ongoing chance of isolated Moderate-class flares. The most likely source is either the large sunspot in the southwest, or the two sunspots in the northeast. These also bring a very slight chance of Strong class flares.

Solar Wind / Geomagnetic Activity: There are no Earth-directed CMEs expected. Solar winds are forecast to become elevated later on Day 1 or early Day 2 (21-22 Dec) due to the arrival of the fast wind from a coronal hole. Ongoing fast winds are then expected with a succession of coronal holes moving across the disc. Wind speeds are likely to remain at slightly elevated or elevated levels for the rest of this period.
Quiet to Unsettled geomagnetic activity at first, is expected to become Unsettled to Active later on Day 1 or early Day 2, with a chance of isolated Minor Storm intervals. This chance decreases a little into Day 3 (23 Dec), before increasing slightly again on Day 4 (24 Dec) as a somewhat larger coronal hole is likely to give slightly stronger wind speeds.

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Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) is expected to persist at background levels with no solar radiation storms occurring. However, there is a slight chance of the count rate increasing with any notable flares, potentially reaching the S1/Minor Radiation Storm level.

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	30	30	20	30
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	40	40	40	40
Very Active	R3 to R5 X	No	5	5	5	5

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	10	10	5	5
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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